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(54) Abstract Title
Skimming apparatus with adjustable weir height

(57) Apparatus suitable for skimming a liquid surface, eg a pond or swimming pool, has a rotatable drum 2 having a weir/skimming edge 9, and a float 3 downstream of the weir 9. Rotation of the drum 2, and thus the height of the weir 9, is dependent on the water level in the housing 1 downstream of the weir 9. As water is removed from the housing 1, eg by a pump at 12, the float 3 drops, and through a system of arms 4 and gears 5 and 6, the drum 2 can rotate thus lowering the weir 9 and allowing water to flow over the weir 9. The weir 9 is raised again as the float 3 is raised, eg when the liquid level in the housing raises as the pump rate is reduced. The drum 2 may have a filter 11 downstream of the weir 9. The apparatus may have a UV lamp to irradiate floating mosquito eggs, pupae or larvae. With the adjustable weir height, the flow into the housing 1 can match the outflow due to the pump. Scum, litter and leaves can thus be removed from the liquid surface.

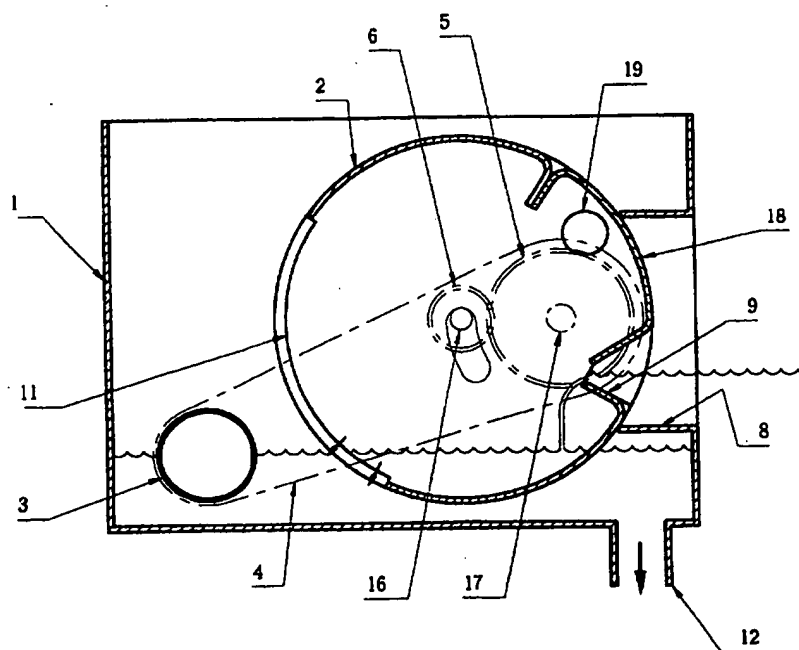
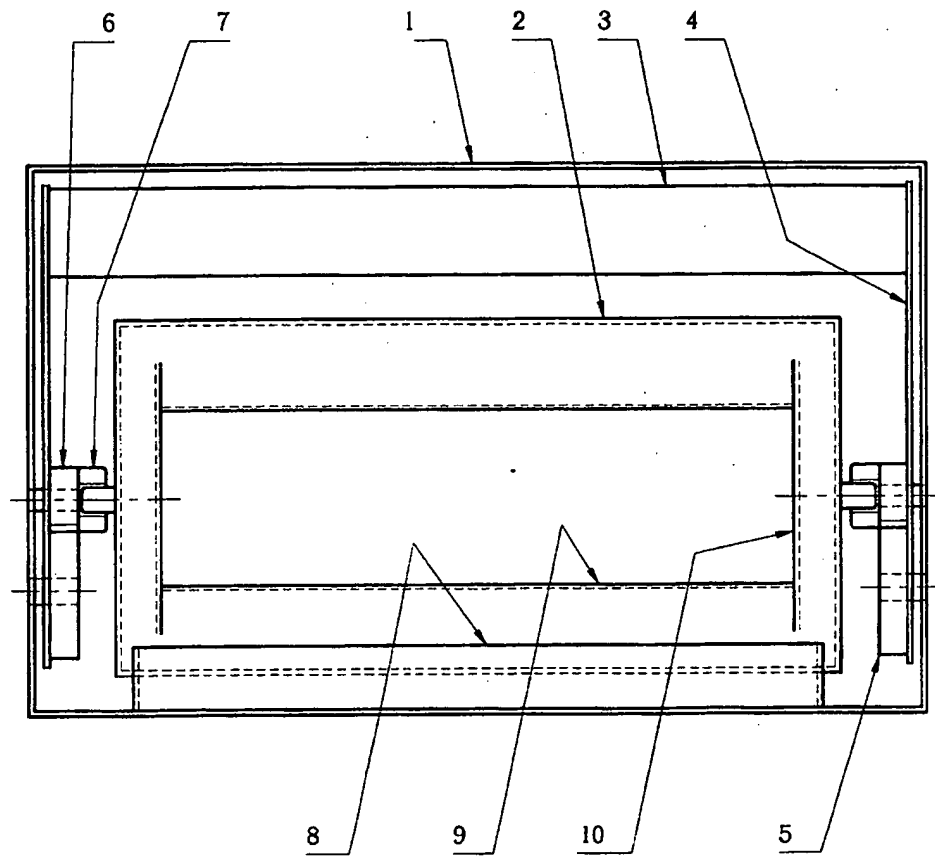


Fig 7

GB 2 353 231 A

Fig 1



2/4

Fig 2

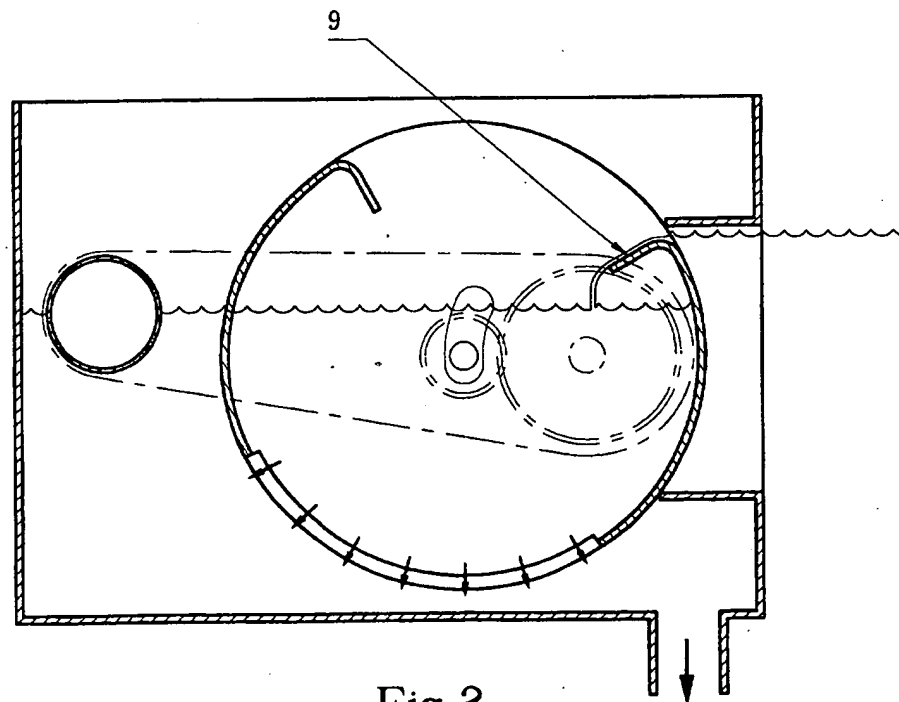
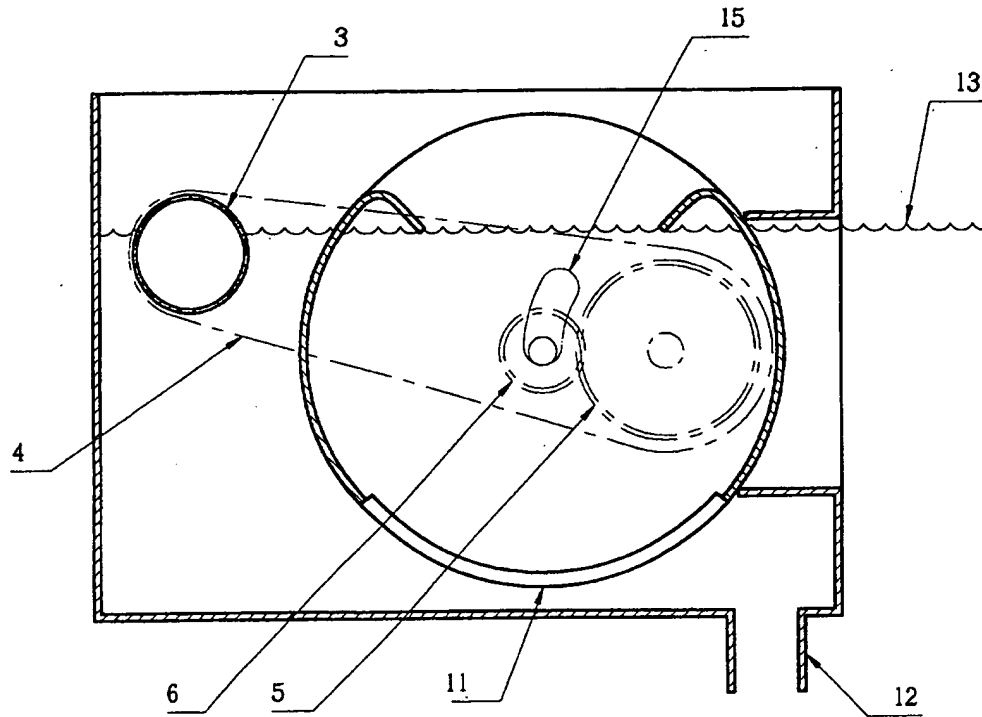


Fig 3

3/4

Fig 4

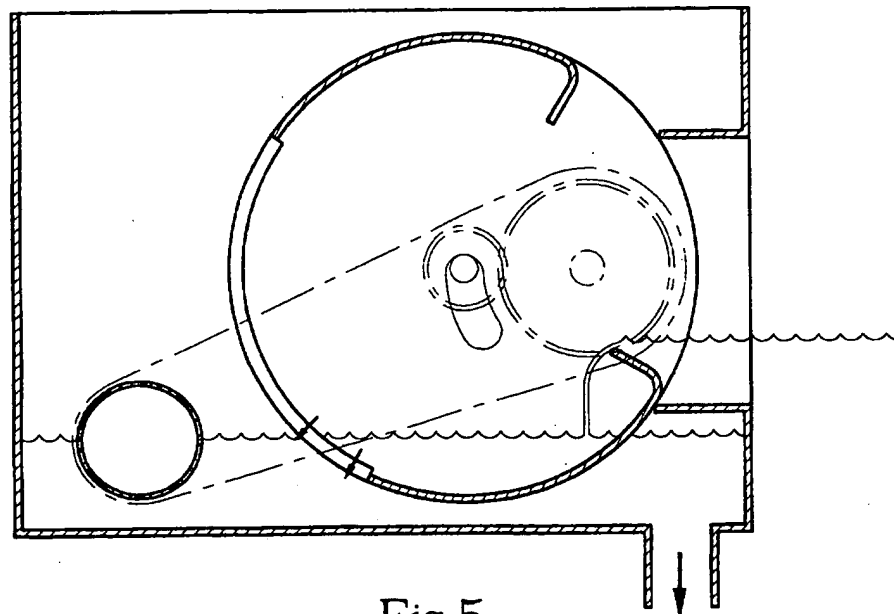
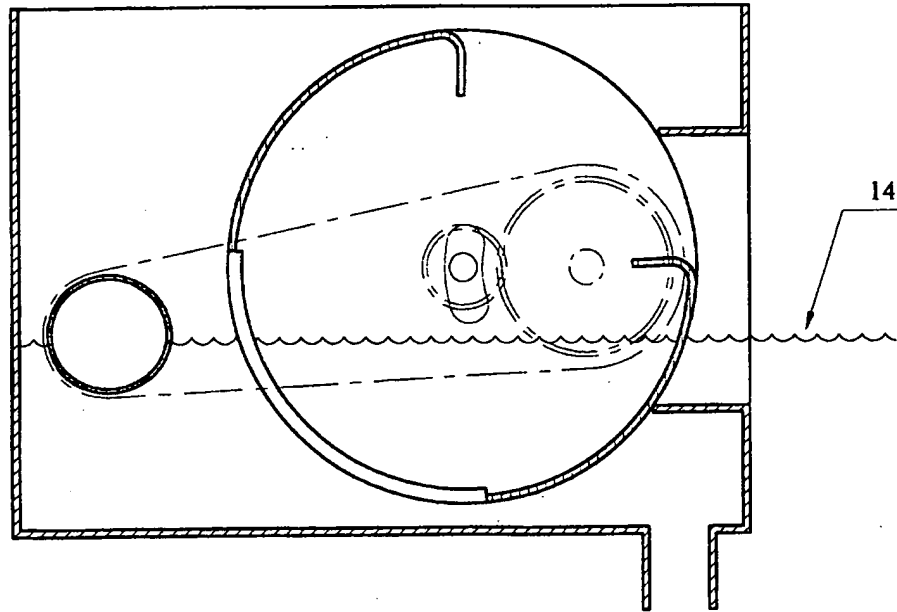


Fig 5

Fig 6

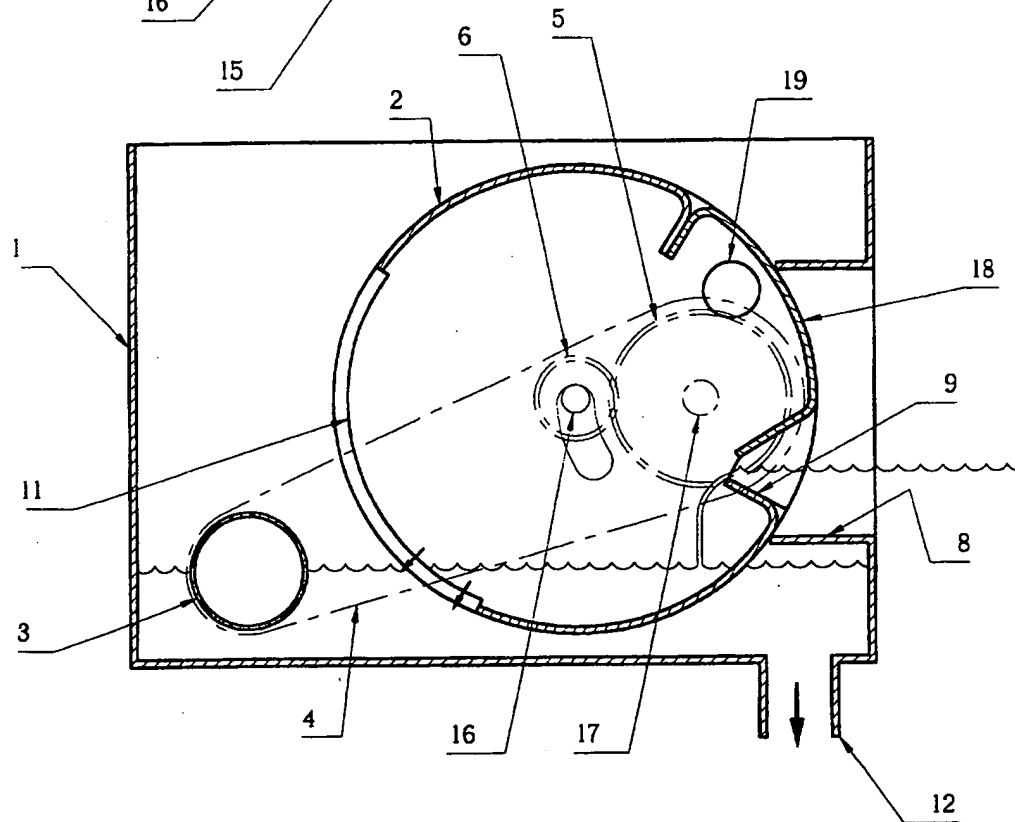
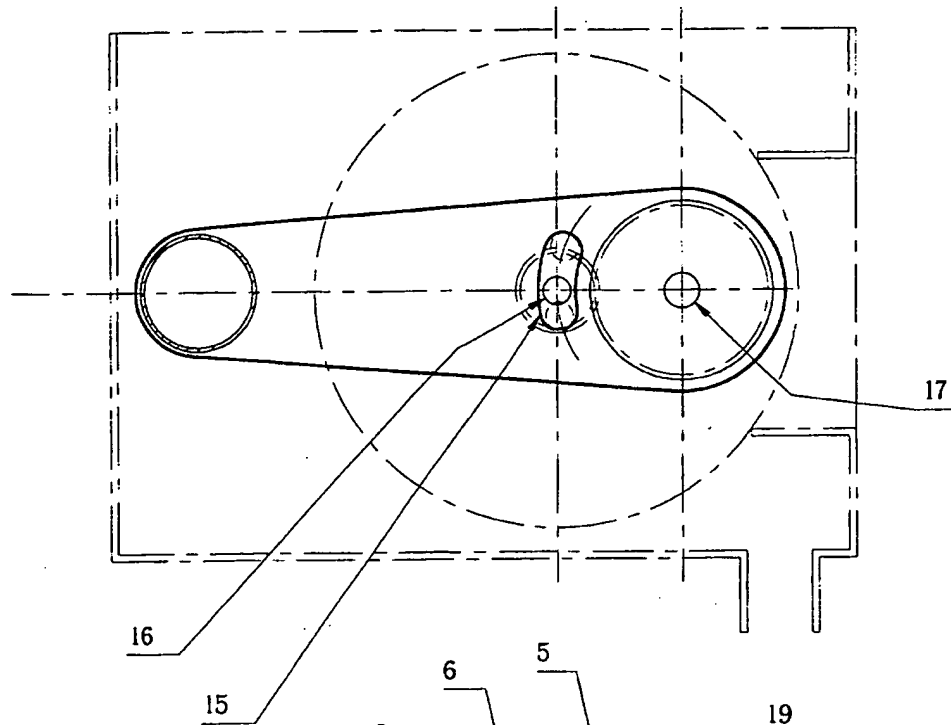


Fig 7

TITLE

Apparatus for Skimming a Liquid Surface

DESCRIPTION

This invention relates to apparatus for skimming a liquid surface.

The apparatus is intended to be used to maintain the surface of, for example, ornamental or display ponds (or "water features"), fishponds and swimming pools by removing, for example, leaves, litter and scum.

In accordance with the present invention, there is provided an apparatus for skimming a liquid surface, comprising a weir having an adjustable level, means to permit the level of the liquid which has passed over the weir to be lowered (e.g. by a pump, siphon or drainage to a lower level), means for detecting the level of the liquid which passed over the weir, and means for adjusting the level of the weir in dependence upon the detected level. The adjustment means can therefore be arranged so that there is automatically a fairly consistent flow of liquid over the weir, regardless (within limits) of the level of the liquid on the upstream side of the weir.

Preferably the apparatus includes a filter arranged to filter liquid which has passed over the weir. In this case, the detecting means is preferably arranged to detect the level of the liquid which has been filtered. If this is done, the filter not only filters the liquid, but also damps the movement of the float and weir so that they do not oscillate greatly or resonate in response to waves in the liquid.

Preferably, the detecting means comprises a float. In this case, the float is preferably mounted for pivotal movement about a generally horizontal axis.

Preferably, the weir is mounted for pivotal movement about the, or another, generally horizontal axis. In this case and in the case where the float is mounted for pivotal movement (which has the advantage that a very compact arrangement can be provided), the adjusting means preferably comprises a proportional drive between the angular position of the float and the angular position of the weir. The drive preferably causes contra-rotation between the float and the weir. The drive preferably simply comprises a pair of meshing gears fixed relative to the float and the weir, respectively.

The apparatus is preferably arranged so that the liquid can leak between the two sides of the weir without passing over the weir. A small amount of leakage does not have any significant detrimental effect on the operation of the apparatus, but obviates the need for good seals between the moving parts, which would add to the cost of the apparatus and also produce friction.

Especially when used in water containing fish, the weir is preferably provided by a portion of an apertured member below the aperture therein so that the size of the aperture limits the size of the matter which can pass over the weir. In this case, a portion of the apertured member above the aperture is preferably movable relative to, or removable from, the remainder of the apertured member to provide cleaning access to the downstream side of the weir, and in particular to the filter, if provided.

Especially when used in water on which is floating undesirable living matter such as mosquito eggs, pupae and larvae, the apparatus preferably includes an ultraviolet light source arranged to irradiate matter which has passed over the weir.

The weir, filter if provided, detecting means and adjusting means may be contained in a housing, which may be fixed or arranged to float in the liquid. Alternatively, they may be fitted into some larger apparatus or into the natural surroundings.

A specific embodiment of the invention and a modification thereto will now be described, being a fixed, boxed skimmer operating in water, by way of example, with reference to the accompanying drawings in which:

Figure 1 identifies the major components

Figures 2 to 5 show sections through the skimmer at differing operational states.
Namely:

Figure 2 not in operation and the external fluid level at its upper limit.

Figure 3 in operation and the external fluid level at its upper limit.

Figure 4 not in operation and the external fluid level at its lower limit.

Figure 5 in operation and the external fluid level is at its lower limit.

Figure 6 illustrates the operation of the geared float arm and drum gear.

Figure 7 illustrates the addition of a skimmer guard and ultraviolet lamp.

Referring to figures 1 to 6. The whole skimmer is contained within a box 1, which has a rimmed aperture 8 in the front face. The box is drawn without any lid, but may be provided with one. The rimmed aperture is shaped to the diameter of a drum 2, which houses the skimming aperture and skimming edge 9. The ends of the skimming aperture 10 are rimmed to maintain a sufficient seal against the box rimmed aperture 8 as the drum 2 rotates. The drum 2 is removable for cleaning of a filter element 1.1, being located at each end to a slide out socket arrangement 7. The drum 2 is linked to a float 3 by float

arms 4 and gears 5 6. The range of rotation of the float, ergo that of the drum, is limited within design limits by the gear ratio and the geometry of the slots 15 in the arms 4. This is to ensure alignment of the drum sockets 7 for drum 2 removal, and to maintain the seal between the drum 2 and the top and bottom edges of the box rimmed aperture 8. Both pins 16 17, about which the drum 2 and the arms 4 rotate, are securely fixed to the box ends.

The amount of buoyancy turning moment provided by the float 3 is arranged to be half that of the weight turning moment of the float 3 and float arms 4. In this way the rotational forces applied to the drum 2 are approximately equal in each direction of rotation. The drum 2 requires balancing on completion, by the addition of weights at appropriate locations, to prevent it contributing any turning moment to the mechanical system during skimmer operation.

The skimmer operates over a range of water level, between high water 13 (Figures 2 and 3) and low water 14 (Figures 4 and 5). At all water levels between high and low water the skimming edge 9 of the drum 2 is maintained a short distance above the water level when the box is not being drained (Figures 2 and 4). Operation of a remote means 12 to drain the water level at the float 3, causes the drum 2 to rotate until the rate of flow of water over the skimming edge 9 balances with the flow leaving the box (Figures 3 and 5). Upon stopping water removal, the float 3 immediately starts to rise in response to continued ingress of water over the skimming edge 9. Once the skimming edge 9 is raised clear of the water, water continues to seep past the imperfect seal between the drum rim 10 and the box skimming aperture 8, until the internal water level has returned to that outside the box.

The skimming aperture is arranged to be large enough for at least human hand access to remove debris without removing the drum, which, for some designs, would be too heavy. In these cases, or for any other reason, the drum need not be made removable.

A drum aperture that is large enough to access for cleaning could be too large for the skimming application. Therefore, as shown in figure 7, an optional hinged or removable skimmer guard 18 provides a means to govern the size of the skimming aperture to the particular requirements. This might be to prevent larger items of debris or marine life from interrupting the skimming process or being trapped within the skimmer.

The addition of an ultraviolet lamp 19, within the skimmer guard, provides a means to irradiate floating mosquito eggs, pupae and larvae trapped during the skimming action. Power supply to the lamp would be arranged from a suitable box lid, controlled in any way desirable, whether manually or automatically outside the box 1, or automatically within the box 1 by a position switch or similar.

It should be noted that the embodiment of the invention and modification thereto have been described above purely by way of example and that many other modifications and developments may be made thereto within the scope of the present invention.

CLAIMS

1. An apparatus for skimming a liquid surface, comprising a weir having an adjustable level, means to permit the level of the liquid which passed over the weir to be lowered, means for detecting the level of the liquid which passed over the weir, and means for adjusting the level of the weir in dependence upon the detected level.
2. An apparatus as claimed in claim 1, further including a filter arranged to filter liquid which has passed over the weir.
3. An apparatus as claimed in claim 2, wherein the detecting means is arranged to detect the level of the liquid which has been filtered.
4. An apparatus as claimed in any preceding claim, wherein the detecting means comprises a float.
5. An apparatus as claimed in claim 4, wherein the float is mounted for pivotal movement about a generally horizontal axis.
6. An apparatus as claimed in any preceding claim, wherein the weir is mounted for pivotal movement about the, or another, generally horizontal axis.
7. An apparatus as claimed in claim 6 when dependent on claim 5, wherein the adjusting means comprises a proportional drive between the angular position of the float and the angular position of the weir.
8. An apparatus as claimed in claim 7, wherein the drive causes contra-rotation between the float and the weir.

9. An apparatus as claimed in claim 8, wherein the drive comprises a pair of meshing gears fixed relative to the float and the weir, respectively.
10. An apparatus as claimed in any preceding claim, and arranged so that the liquid can leak between the two sides of the weir without passing over the weir.
11. An apparatus, as claimed in any preceding claim, wherein the weir is provided by a portion of an apertured member below the aperture therein so that the size of the aperture limits the size of the matter which can pass over the weir.
12. An apparatus as claimed in claim 11, wherein a portion of the apertured member above the aperture is movable relative to, or removable from, the remainder of the apertured member to provide cleaning access to the downstream side of the weir.
13. An apparatus as claimed in any preceding claim, and including an ultraviolet light source arranged to irradiate matter which has passed over the weir.
14. An apparatus as claimed in any preceding claim, wherein the weir, detecting means and adjusting means are contained within a housing.
15. An apparatus for skimming a liquid surface, substantially as described with reference to Figures 1 to 6 of the drawings, or those figures as modified by figure 7 of the drawings.



8

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Claims searched: 1 to 15

Examiner: John Hewet
Date of search: 4 November 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): B1D (DPBA, DMBD, DNRA, DNRY)

Int Cl (Ed.6): B01D 17/02; E02B 7/38, 7/40, 7/46, 7/50, 15/04, 15/10; E04H 4/12

Other: Online: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2268091 A	(KKS) see especially page 10 line 7 to page 11 line 22 and the figures	1 to 4, 13 and 14
X	GB 2044625 A	(AA) see especially page 1 lines 6 to 15 and 67 to 83 and the figure	1 to 4, 13 and 14
X	GB 1549343	(GORE) see especially page 4 line 104 to 108 and adjustable, floating "weir" 30 of the figures	1, 2, 4 to 7 and 10 to 14
X	GB 1553758	(HARTWICK et al) see especially "weir" 24 and page 1 line 86 to page 2 line 17	1 to 3, 6, 13 and 14

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.